

IN THE SPECIFICATION

Please replace the paragraph beginning at page 5, line 24, with the following rewritten paragraph:

The present invention further provides a Group VIII metal complex comprising a Group VIII metal compound and a bisphosphine (I) (hereinafter referred to as "Group VIII metal complex (A)"). (I").

Please replace the paragraph beginning at page 6, line 3, with the following rewritten paragraph:

The present invention still further provides a process for producing aldehydes, which comprises, on hydroformylation of an ethylenically unsaturated compound with carbon monoxide and hydrogen in the presence of a catalyst to produce the corresponding aldehyde, using as the catalyst the Group VIII metal complex (A). (I).

Please replace the paragraph beginning at page 8, line 23, with the following rewritten paragraph:

R¹ and R² may combinedly form a ring together with the phosphorus atom bonded thereto. Examples of such phosphorus-containing heterocyclic ring rings are 2,5-dimethylphospholane, 2,5-diethylphospholane, 2,5-dipropylphospholane, 2,5-diisopropylphospholane, 5H-Benzo[b]phosphindole, 5,10-dihydro-acrylidophosphine, 10H-Phenoxaphosphine, and 10H-Phenothiaphosphine. 5H-dibenzophosphor, 9,10-dihydro-9- phosphinethracene, 10H-phenoxaphosphine and 10H-9-thia-10-phosphinethracene. Preferred examples of the alkyl groups which may be represented by R³ or R⁴ are those having 1 to 4 carbon atoms, such as methyl, ethyl, propyl, isopropyl, butyl and isobutyl.

Please replace the paragraph beginning at page 9, line 7, with the following rewritten paragraph:

The bisphosphines (I) are novel compounds that have not been described in the literature. The Group VIII metal complexes (A) (I) comprising a component of bisphosphine (I) realize, as described later herein, excellent reaction results when used as hydroformylation catalysts. Preferred bisphosphines (I) are those with, in the general formula (I), Ar¹ and Ar² each representing phenylene, R¹ and R² each representing phenyl, and R³ and R⁴ each representing hydrogen. Representative examples of such bisphosphines (I) are 2,2'-bis(diphenylphosphinomethyl) diphenyl ether, 2,2'-bis(diphenylphosphinomethyl)-6-methoxy-diphenyl ether and 2,2'-bis(diphenylphosphinomethyl)-4-t-butyl diphenyl ether.

Please replace the paragraph beginning at page 19, line 20, with the following rewritten paragraph:

The Group VIII metal complexes (A) (I) comprising a bisphosphine (I) and a Group VIII metal compound are novel compounds that have not been described in the literature. These complexes can act as catalysts for hydroformylation and exert high catalytic activity. These complexes can, when used for hydroformylation of ethylenically unsaturated compounds, produce n-aldehydes with high selectivity and suppress side reactions such as hydrogenation and isomerization.

Please replace the paragraph beginning at page 22, line 10, with the following rewritten paragraph:

There are no specific restrictions with respect to the preparation process for the Group VIII metal complex (A). (I). For example, the complex can be prepared by a process which

comprises separately preparing a solution of a Group VIII metal compound in a solvent that does not influence the hydroformylation and a solution of a bisphosphine (I) prepared in the same manner, introducing the two solutions separately into a hydroformylation reactor and effecting reaction therein to produce a complex. The complex can also be prepared by introducing a bisphosphine (I) into the above Group VIII metal compound solution and then adding a solvent that does not affect the hydroformylation, to obtain a homogeneous solution.

Please replace the paragraph beginning at page 22, line 24, with the following rewritten paragraph:

The process for hydroformylation of ethlenically unsaturated compounds with carbon monoxide and hydrogen in the presence of a Group VIII metal complex (A), (I), to produce the corresponding aldehydes is now described.

Please replace the paragraph beginning at page 23, line 22, with the following rewritten paragraph:

The process for hydroformylation of ethlenically unsaturated compounds with carbon monoxide and hydrogen in the presence of a Group VIII metal complex (A), (I), to produce the corresponding aldehydes is now described.

Please replace the paragraph beginning at page 24, line 3, with the following rewritten paragraph:

The hydroformylation is carried out either in the presence or absence of a solvent. Examples of solvents usable for this purpose are aromatic hydrocarbons, e.g. benzene, toluene, ethylbenzene, propylbenzene, butylbenzene, isobutylbenzene, s-butylbenzene, t-butylbenzene, o-xylene, m-xylene, p-xylene, o-ethyltoluene, m-ethyltoluene and p—

ethyltoluene; saturated aliphatic hydrocarbons, pentane, hexane, heptane, octane, nonane, decane and cyclohexane; alcohols, e.g. methyl alcohol, ethyl alcohol, propyl alcohol, isopropyl alcohol, butyl alcohol, isobutyl alcohol, s-butyl alcohol, t-butyl alcohol, pentyl alcohol, isopentyl alcohol, neopentyl alcohol, t-pentyl alcohol, 2-phenylethanol and 2-phenoxyethanol; ethers, e.g. dimethyl ether, ethylmethyl ether, diethylether, dipropyl ether, butyl methyl ether, t-butyl methyl ether, dibutyl ether, ethyl phenyl ether, diphenyl ether, tetrahydrofuran, 1,4-dioxane, ethylene glycol, propylene glycol, diethylene glycol, ethylene glycol monomethyl ether, ethylene glycol dimethyl ether, diethylene glycol diethyl ether, triethylene glycol, triethylene glycol dimethyl ether, tetraethylene glycol, tetraethylene glycol dimethyl ether, polyethylene glycol, polypropylene glycol, polyethylene glycol monomethyl ether, polyethylene glycol dimethyl ether and polyethylene glycol dimethyl diethyl ether; esters, e.g. methyl acetate, ethyl acetate, propyl acetate, butyl acetate, isopentyl acetate, phenyl acetate, methyl propionate, ethyl propionate, methyl benzoate and ethyl benzoate; ketones, e.g. acetone, ethyl methyl ketone, methyl propyl ketone, ethyl ketone, ethyl propyl ketone, dipropyl ketone, acetophenone, ethyl phenyl ketone, 1-phenyl-1-propanone, 1-phenyl-1-butanone and 1-phenyl-2-proponeone; halohydrocarbons, e.g. chloromethane, dichloromethane, trichloromethane, tetrachloromethane, chloroethane, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, 1,2-dichlorohexane, chlorobenzene, o-dichlorobenzene, m-dichlorobenzene, p-dichlorobenzene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,3,5-trichlorobenzene, fluoroethane, difluoromethane, 1,1-difluoroethane, fluorobenzene, o-fluorotoluene, m-fluorotoluene, p-fluorotoluene and α , α , α -trifluorotoluene; cyanohydrocarbons, e.g. acetonitrile, propionitrile, 1-cyanopropane, cyanobenzene, o-cyanotoluene, m-cyanotoluene and p-cyanotoluene; aprotic polar solvents, e.g. N,N-dimethylformamide, hexamethylphosphoramide, 1,3-dimethyl-2-imidazolidinone and 1-methyl-2-

pyrrolidinone; and water. These solvents may be used singly or in combination of 2 or more. There is no particular limitation to the amount of the solvent used.

Please replace the paragraph beginning at page 26, line 16, with the following rewritten paragraph:

Although there are no specific restrictions with respect to the method of feeding starting materials, it is desirable to feed an ethylenically unsaturated compound, a Group VIII metal complex (A) Θ solution prepared separately and, as necessary, a solvent and then introduce a mixed gas of hydrogen and carbon monoxide under a prescribed pressure. Then the reaction is desirably effected with stirring at a prescribed temperature.

Please replace the paragraph beginning at page 30, line 15, with the following rewritten paragraph:

A 1-liter three-necked flask equipped with a reflux condenser, a Dean-Stark apparatus, a dropping funnel, a thermometer and a mechanical stirrer was charged with 500 ml of toluene, 36.5 g (0.65 mole) of potassium hydroxide and 90 g (0.65 mole) of the 2-hydroxy-3-methoxytoluene synthesized in Reference Example 3. The three-necked flask was heated at 120°C, while the water that generated was continuously removed from the flask using the Dean-Stark apparatus. After the water removal, the solvent was removed mostly under reduced pressure. To the mixture, 10 g of activated copper powder and 700 g (4.1 moles) of 2-bromotoluene were added and, while the water that generated was continuously removed from the reaction liquid using the Dean-Stark apparatus, the flask was heated up to a liquid temperature of 190°C. Stirring was continued for 10 hours at the same temperature. After completion of the reaction, the reaction mixture was allowed to cool to room

temperature. To the mixture 400 mL of diethyl ether was added, and the obtained solution
was filtered through Celite. The filtrate was distilled under a reduced pressure of 0.5 mmHg, to
give a distillate at 120°C. This distillate was recrystallized from a solvent of hexane, to
yield 90 g of a colorless crystal of 2,2'-dimethyl-6-methoxy-diphenyl ether having the
following properties. The yield was 61% based on the 2-hydroxy-3-methoxytoluene.

Please replace the paragraph beginning at page 44, line 3, with the following rewritten paragraph:

In the hydroformylation of 7-octen-1-al, comparison of Examples 4 and 7 with Comparative Examples 2 and 3 reveals that Group VIII metal complexes (A) (II) comprising bisphosphines can exert higher catalytic activity than Group VIII metal complexes comprising known bisphosphines and, further, cause no side reactions such as hydrogenation and isomerization. Besides, as shown in Examples 5 and 6, changing the reaction conditions employed in Example 4 can increase the n/iso ratio and catalytic activity. On the other hand, comparison of Examples 4 and 7 with Comparative Example 1 reveals that Group VIII metal complexes (A) (II) comprising bisphosphines (I), cause, similarly to a commercially employed Group VIII metal complex comprising triphenylphosphine, no side reactions such as hydrogenation and isomerization, while the former has higher n/iso ratio and catalytic activity than the latter.

Please replace the paragraph beginning at page 44, line 20, with the following rewritten paragraph:

In the hydroformylation of 1-octene, comparison of Examples 8 and 9 with Comparative Examples 5 and 6 reveals that Group VIII metal complexes (A) (II) comprising bisphosphines (I) can exert higher catalytic activity than Group VIII metal complexes

comprising known bisphosphines and, further, suppress side reactions such as hydrogenation and isomerization. On the other hand, comparison of Examples 8 and 9 with Comparative Example 4 reveals that Group VIII metal complexes (A) \oplus comprising bisphosphines (I) can suppress side reactions such as hydrogenation and isomerization to a lower level and achieve higher n/iso ratio and catalytic activity than a Group VIII metal complex comprising a commercially employed triphenylphosphine.

Please replace the paragraph beginning at page 45, line 9, with the following rewritten paragraph:

According to the present invention, there are provided hydroformylation catalysts comprising Group VIII metal complex (A) \oplus that can, on hydroformylation of ethylenically unsaturated compounds, exert high catalytic activity and yield n-aldehydes with high selectivity while suppressing side reactions such as hydrogenation and isomerization, and bisphosphines (I) constituting such complexes and process for production thereof.

Please replace the paragraph beginning at page 45, line 19, with the following rewritten paragraph:

According to the present invention, use of the Group VIII metal complexes (A) \oplus for hydroformylation of ethylenically unsaturated compounds with carbon monoxide and hydrogen can lead to production of the corresponding n-aldehydes at high reaction rate and with high selectivity, while suppressing side reactions such as hydrogenation and isomerization.